



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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THOMAS V. SKINNER, DIRECTOR

217.782.6762

November 27, 2000

Mr. Kevin Turner
U.S. EPA
c/o Crab Orchard National Wildlife Refuge
8588 Route 148
Marion, IL 62959

Reference: 1630200005 St. Clair County
Sauget Area 1 Site
Superfund/Technical
Time Critical Removal Action Work Plan/Response to Comments - Part II
Administrative Order dated May 31, 2000; Docket No.: V-W-99-C-554

Dear Mr. Turner:

The purpose of this letter is to provide you with a paper version of Rob Watson's review comments and review notes on the referenced project. It is my understanding that on November 22, 2000, Rob sent an electronic version of his comments and notes to you and Mike McAteer.

If you have any questions, please call me at 217.785.9397 or Rob at 217.524.3265.

Sincerely,

A handwritten signature in cursive script that reads "Candy Morin".

Candy Morin, Remedial Project Manager
National Priorities List Unit
Federal Site Remediation Section
Division of Remediation Management
Bureau of Land

Enclosure

GEORGE H. RYAN, GOVERNOR

cc w/enclosure: Mike McAteer, EPA Region V
 W. Rob Watson, IEPA
 Mike Henry, IDNR
 Denise Stoeckel, IDNR
 Kevin de la Bruere, USFWS

sgtareal/wrwrap11.00

**1630200005 – St. Clair County
Sauget Area 1, Dead Creek
Sediment Containment Cell
Superfund/Technical File**

Reviewer: Rob Watson *W. Watson*
Review Dates: November 22, 2000

Re: Response to Comments Part II

Comments to Monsanto / Solutia

Introduction

On November 3, 2000, Monsanto/Solutia (M/S) submitted additional responses to USEPA's comments made on the Time Critical Removal Work Plan. Dead Creek Sediment and Soil in Sauget and Cahokia. This submittal is considered Part II of Solutia's response to comments. Part II addresses all of M/S's Group 1 comments and my "must have" comments.

The following comments identify the issues that were not adequately addressed in the November 3, 2000 submittal. These items need to be resolved before the Design Report can be finalized.

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
8	1	The technical data sheets included for Appendix H do not include the height of the textured surface (asperity height) of the HDPE geomembrane as requested in Comment 8.
11	6 (technically impractical)	At the October 10, 11, 2000 meeting M/S also agreed to place the more highly contaminated material (e.g. Segment B) more to the middle of the fill, not near the bottom or sides. The response does not address this issue.
12	8	A more legible geologic cross section with all of the information requested in Comment 12 needs to be provided. The colors used to differentiate the geologic strata need to be lighter and the water table should be identified graphically on the cross-section. The information presented in the figure includes a very large distance. Therefore, it is recommended that the geologic cross section and other information be presented on a full size drawing.
20.a, b	5, 6 (technically impractical)	The response to comment 20 needs to indicate when M/S will incorporate the test data into Appendix A of the Design Report.
24.a	4	The narrative in Section 4.2.3 needs to be revised in order to address Comment 24.a and make the section consistent with the revised calculations in Appendix C.
24.d	3	The narrative in Section 4.2.3 and the calculations in Appendix C (Attachment 10 to the response to comments) both need to be revised in order to clearly identify the minimum factor of safety (FS) against slope failure that will be acceptable. The FS for slope stability at this site should not be less than 1.5. A lower FS will also result in a lower

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		interface friction angle being used in the design.
24.f	3	The interface friction angle should be determined for more than the two interfaces proposed in the response to comments. This is necessary in order to insure that the worst-case friction angle is in fact determined and accounted for in the design. For example, it is recommended that the soil – GCL and soil – smooth geomembrane interfaces should also be evaluated in the shear box.
24.g	1	It is strongly recommended that testing of the liner materials be performed as soon as the manufacturers of these materials are chosen. This testing would be in addition to, not in place of, the CQA confirmation testing.
29	7	The wording in Section 4.3.3 needs to be revised to reflect the response to Comment 29 and the provisions in Specification 02200 that address Comment 29.
31	4	The wording in Section 4.4.2 needs to be revised to reflect the key provisions and conclusions in the revised GCL load calculations in Appendix C (Attachment 12) that address the concerns in Comment 31.
32 all	1, 7, 1, 2, 4, 1, and 2	The narrative in Section 4.5 needs to be revised to include the wording in the response to comments for Comment 32, 33 & 34. Specifically, the narrative needs to refer to the revised drawings and describe how the leachate collection, detection and gravel capillary sump systems will function. Of particular concern is how the procedures and the alarm system will function to insure the level of leachate does not accumulate above acceptable levels.
39	3, 4	The proposed wording in Attachment 11 needs to be revised to reference the ASTM method that will be used to test the samples, and the “selected geosynthetics” for which interface friction angles will be determined.
40	1	The proposed revision to Section 1.3.B.2 of Specification 01010 is not correct. It needs to indicate that the geotextile will be placed between the tracked in place soil and the capillary break layer (gravel).
46.a	7	The wording in Section 3.6.A.4 of Specification 02200 needs to be revised to more clearly describe the filling operations.
51	1	Specification 02244 needs to be revised to include: yield stress and yield elongation.
55	1	The response to Comment 55 does not address the comment that Section 2.1 of Specification 02245 refers to a “lock-stitched” GCL.
56	1	The minimum values for all of the parameters in Table 1 in Specification 02245 need to be provided in the Table.
57	1	The GCL Loading calculations in Attachment 12, and probably the Liner System Stability Calculations in Attachment 10, need to be revised to include the <u>internal</u> friction angle for the GCL.
61	1	The minimum value for transmissivity in Specification 02246 is not acceptable or consistent with other portions of the Design Report, and

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		the units of measurement are not correct. The design report needs to demonstrate that the geonet will have a transmissivity equal to 12 inches of sand with a hydraulic conductivity of 1×10^{-2} cm/sec as stated in Section 4.5.2 (see Comment 35). This is the transmissivity value that should be required in Specification 02246. [An acceptable value for transmissivity is on the order of 1×10^{-4} m ² /sec.] In addition, the narrative in Section 4.1.1 may need to be revised since it states the hydraulic transmissivity of the geonet will be at least 3×10^{-1} cm ² /sec (3×10^{-5} m ² /sec).
64/65	7	The narrative in the Design Report should be revised to include the response to Comment 64. For example, Section 3.3 in the revised geonet Specification 02246 still shows that the contractor is responsible for taking confirmation samples. From the response to Comment 64 it appears that the CQA Consultant should perform this job. If this interpretation is correct, Specification 02246 (and portions of other specifications) may also need to be revised.
66	1	The revised CQA manual for geosynthetic materials (Appendix F) should have been provided with the November 3, 2000 submittal. This revised CQA manual needs to be provided for review before the Design Report is finalized.
68	1	The Table in Attachment 23 needs to be revised to include the following properties, their test methods, and minimum values: Geomembrane: yield strength, yield elongation, and asperity height. GCL: grab tensile strength. The minimum values for some of the parameters on this table may also need to be revised based on earlier comments in this review (e.g. transmissivity for the geonet, and the minimum internal friction angle for the GCL).
74	1	The revised CQA manual for soil materials (Appendix G) should have been provided with the November 3, 2000 submittal. This revised CQA manual needs to be provided for review before the Design Report is finalized.
78	1	The response to this comment only addresses the testing of borrow soils for TCL/TAL constituents. It does not address the requirement to analyze soils per the referenced USEPA guidance document. Therefore, the parameters and their frequencies are specified below. [See copies of Tables 2.3 and 2.10 from USEPA Technical Guidance Document titled Quality Assurance and Quality Control for Waste Management Facilities (EPA/600/R-93/182, September 1993).] The soils identified in Tables 1A and 1B in Attachment 24 should be analyzed for the following parameters at the specified frequencies: Moisture Content: 1 test per 2,500 cu yd or each change in material. Atterberg Limits: 1 test per 6,500 cu yd or each change in material. Percentage Fines: 1 test per 6,500 cu yd or each change in material. Percent Gravel: 1 test per 6,500 cu yd or each change in material.

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		<p>Compaction Curve: 1 test per 6,500 cu yd or each change in material.</p> <p>Hydraulic Conductivity: 1 test per 13,000 cu yd or each change in material.</p> <p>The soils identified in Tables 1C in Attachment 24 should be analyzed for the following parameters at the specified frequencies:</p> <p>Field Placed Moisture and Density (rapid tests): 5 tests per acre per lift</p> <p>Water Content (ASTM D2216): one in every 10 rapid moisture content tests.</p> <p>Total Density (ASTM D1556, 1587, or 2167): one in every 20 rapid density tests.</p>
82	2	The narrative in the Design Report needs to be revised to include the response to Comment 82.
84	2	The response did not fully address the issues in Comment 84. Each of the items in Comment 84 needs to be addressed individually. In addition, the response needs to indicate if the concrete down shoot (and the calculations for it in Appendix D) need to be removed from the application.

**1630200005 – St. Clair County
Sauget Area 1, Dead Creek
Sediment Containment Cell
Superfund/Technical File**

Reviewer: Rob Watson *W. Watson*

Review Dates: November 16, 2000 to November 22, 2000

Re: Response to Comments Part II

REVIEW NOTES

Introduction

On November 3, 2000, Monsanto/Solutia (M/S) submitted additional responses to USEPA's comments made on the Time Critical Removal Work Plan, Dead Creek Sediment and Soil in Sauget and Cahokia. This submittal is considered Part II of Solutia's response to comments. Part II addresses all of M/S's Group 1 comments and my "must have" comments. The format for these review notes follows that of the October 10 and 11, 2000 meeting with Monsanto/Solutia with the Group 1 comments inserted in the appropriate locations.

These review notes pertain solely to the November 3, 2000 submittal. No other aspects of the Design Report were reviewed at this time.

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
1	None	OK. The response to comments Part II that is the subject of this review adequately addressed this comment.
2	None	OK, the table that will be incorporated into Section 2.0 is adequate.
3	None	OK. The figures will be removed.
4	None	OK. The statement in Section 4.2.1 regarding earlier excavation of the site will be removed.
5	None	OK. The technical data sheets (Cut Sheets) for the geosynthetic materials M/S plan to use were provided and are adequate. These will be included in Appendix H of the Design Report.
6	1	OK. Section 4.1.1 will be revised to require a geotextile be installed between the gravel capillary break layer and the GCL bedding layer. The technical data sheet and strength calculations for the geotextile show that the proposed product will be strong enough for its intended purpose and should not tear.
7	1	OK. While the document still calls for "Tracked In-Place" soils to be used under the GCLs, Specification 02200 has been revised to include a new section (3.7) for the preparation of the soils prior to placement of the GCL material. Specification 02200 includes specifications for the density, moisture content, and requires the surface of the soil to be smooth rolled prior to placement of GCL materials.
8	1	OK. The document now indicates a HDPE geomembrane that is textured on one side will be used for the secondary liner. The textured surface will face the GCL. The side facing the drainage

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		material will be smooth. Figure 4-1 shows the geomembrane used in the primary liner will remain smooth on both sides. The technical data sheets included for Appendix H do not include the height of the textured surface (asperity height) as requested in Comment 8.
9	10	OK. see Specification 2200.
10	6 (technically impractical)	OK. The revisions provided in response to Comment 11 below should provide sufficient protection for the side slope liner materials.
11	6 (technically impractical)	OK. The main concern of this comment was that the liner materials on the side slopes are protected from objects in the wastes that may puncture them. Wording will be added to the end of Section 5.0 and Section 3.3.F in Specification 02225 that requires screened sediments that are free of sharp objects larger than 2" to be placed on the side slopes. The proposed wording is acceptable. At the October 10, 11, 2000 meeting M/S also agreed to place the more highly contaminated material (e.g. Segment B) more to the middle of the fill, not near the bottom or sides. The response does not address this issue.
12	8	OK. A geologic cross section of the site Figure 3.4 was provided. The approximate elevations of the water table are indicated in a table on the same page as the x-section. However, the colors used to identify the strata are too dark. Therefore, the drawing is hard to read. A more legible geologic cross section with all of the information requested in Comment 12 needs to be provided. The colors used to differentiate the geologic strata need to be lighter and the water table should be identified graphically on the cross-section. The information presented in the figure includes a very large distance. Therefore, it is recommended that the geologic cross section and other information be presented on a full size drawing.
13	1	OK. The liner system load calculations to be included in Appendix C of the Design Report are acceptable.
14	1	OK. The anchor system design calculations to be included in Appendix C of the Design Report are acceptable.
16.b, c	6 (technically impractical)	OK. The technical information on GCLs provided in Attachment 8 of the response to comments indicates that the GCL should not become fully hydrated before the confining weight of the waste in the landfill is placed on top of it. This is acceptable.
16.a	10	OK. See above comment on 16.
20.a, b	5, 6 (technically impractical)	OK. M/S provide test data (if appropriate) in Appendix A of the Design Report. However, the response to comments does not indicate when this will be done. The response to comments needs to indicate when M/S will incorporate the test data into Appendix A of the Design Report.
20.c	5	OK. See above comment 20.

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
21.a	5	OK. The settlement calculations that will be included in Appendix B are adequate.
21.c	3	OK. The settlement calculations that will be included in Appendix B are adequate.
24.a	4	The narrative in Section 4.2.3 needs to be revised in order to address Comment 24.a and make the section consistent with the revised calculations in Appendix C.
24.d	3	OK. With the following exceptions, the revised calculations provided in Attachment 10 appear to be acceptable. The narrative in Section 4.2.3 and the calculations in Appendix C (Attachment 10 to the response to comments) both need to be revised in order to clearly identify the minimum factor of safety (FS) against slope failure that will be acceptable. The FS for slope stability at nonhazardous landfills is 1.5. The FS for slope stability at this site should not be less than 1.5. A lower FS will also result in a lower interface friction angle being used in the design. NOTE: for additional review notes – see the e-mail and phone notes from conversation with Prof. Stark at UIUC both dated 11-17-00.
24.f	3	The interface friction angle should be determined for more than the two interfaces proposed in the response to comments. This is necessary in order to insure that the worst-case friction angle is in fact determined and accounted for in the design. For example, it is recommended that the soil – GCL and soil – smooth geomembrane interfaces should also be evaluated in the shear box.
24.g	1	It is strongly recommended that testing of the liner materials be performed as soon as the manufacturers of these materials are chosen. This testing would be in addition to, not in place of, the CQA confirmation testing. If testing is not done prior to the materials arriving at the site and the test results indicate there is a problem, Monsanto/Solutia need to understand, and agree, that the risk was theirs. Therefore, any schedule delays or cost increases due to unacceptable test results will be their responsibilities.
28.e	6 (technically impractical)	See discussion on Comments 24.d, f, and g above.
29	7	OK. The revised Specification 02200 that will be included in Appendix E of the Design Report addresses this comment. The wording in Section 4.3.3 needs to be revised to reflect the response to Comment 29 and the provisions in Specification 02200 that address Comment 29.
30	3	OK. The GCL load calculations that will be included in Appendix C of the Design Report are adequate to address the concerns in Comment 30.
31	4	The response solely references the GCL load calculations in Attachment 12 that will be incorporated into Appendix C of the Design Report. No revised wording for Section 4.4.2 was proposed.

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		The wording in Section 4.4.2 needs to be revised to reflect the key provisions and conclusions in the revised GCL load calculations in Appendix C (Attachment 12) that address the concerns in Comment 31.
32 all	1, 7, 1, 2, 4, 1, and 2	<p>The drawings provided in response to Comment 32 are acceptable. However, the narrative of the Design Report also needs to be revised to address the comment.</p> <p>The narrative in Section 4.5 needs to be revised to include the wording in the response to comments for Comment 32, 33 & 34. Specifically, the narrative needs to refer to the revised drawings and describe how the leachate collection, detection and gravel capillary sump systems will function. Of particular concern is how the procedures and the alarm system will function to insure the level of leachate does not accumulate above acceptable levels.</p>
33	1	See discussion on Comment 32.
34	1	See discussion on Comment 32.
39	3, 4	<p>The proposed revisions to Section 2.3 of Appendix F are not acceptable as written.</p> <p>The proposed wording in Attachment 11 needs to be revised to reference the ASTM method that will be used to test the samples, and the "selected geosynthetics" for which interface friction angles will be determined.</p>
40	1	<p>OK. The minimum values for the geotextile properties in revised Specification 02242 are acceptable. They conform to the calculations performed on the geotextile in Attachment 2 of the response to comments.</p> <p>However, the proposed wording in the response to this comment shows the geotextile should be placed between the tracked in place soil and GCL. This is not correct. It needs to be placed between the tracked in place soil and the gravel.</p> <p>The proposed revision to Section 1.3.B.2 of Specification 01010 is not correct. It needs to indicate that the geotextile will be placed between the tracked in place soil and the capillary break layer (gravel).</p>
41	1	OK. The proposed revision to Section 3.2.B of Specification 02150 is acceptable. It requires the contractor to test collected groundwater, determine if it is hazardous waste, and handle it appropriately.
42	1, 2, 2, 2	OK. The revised Earthwork Specification 02200 adequately addresses the concerns in Comment 42.
43	1	OK. The revised Earthwork Specification 02200 adequately addresses the concerns in Comment 43.
44	2	OK. Notes have been added to the revised drawings that indicate the thicknesses of the layers are compacted, not loose.
46.a	7	Review notes from the October 10, 2000 meeting indicate that Solutia agreed to revise the wording in Section 3.6.A.4 of Specification 02200 to more clearly describe fill operations. This section of

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		Specification 02200 was not revised. The wording in Section 3.6.A.4 of Specification 02200 needs to be revised to more clearly describe the filling operations.
48	1	OK. The proposed revisions to Specification 02225 will adequately address the concerns in Comment 48.
49	1	OK. The locations for placement of the geogrids are shown in Figures 4-9 & 4-10.
50	2	OK. The M/S response is acceptable. Panel layout drawings for the geomembrane will be provided to USEPA 30 days prior to installation.
51	1	The revised Geomembrane Specification 02244 that was provided as Attachment 17 does not include all of the parameters cited in GRI Standard GM13. Specification 02244 needs to be revised to include: yield stress and yield elongation.
52	2	OK. The proposed revision to Section 2.4.A of Specification 02244 identifies fusion double seam welding as the preferable type of welding, where feasible. This is acceptable.
53	1	OK. The proposed revision to Section 3.4.E of Specification 02244 indicates that geomembrane panels will be rolled down the side slopes, not pulled up them. This is acceptable.
54	1	OK. The proposed revision to Section 1.4.B.1 of Specification 02245 indicates that rolls of GCL will be stored off the ground from time of delivery until installation. This is acceptable.
55	1	The response to this comment refers to the technical data sheets for the liner materials provided in Attachment 1. While these data sheets are acceptable to describe their properties, they do not specifically address the comment. The response to Comment 55 does not address the comment that Section 2.1 of Specification 02245 refers to a "lock-stitched" GCL.
56	1	The response indicates Table 1 in Specification 02245 was revised to include all parameters in ASTM D-5889 and the minimum values for those parameters. However, the column in Table 1 that identified the minimum values was removed from the Table. The minimum values for all of the parameters in Table 1 in Specification 02245 need to be provided in the Table.
57	1	The response states the short term, long term, and residual GCL strength calculations are provided in Attachment 12. This is not correct. The <u>internal</u> friction angle for the GCL is not discussed. Only <u>interface</u> friction angles between two materials are considered in the calculations. The GCL Loading calculations in Attachment 12, and probably the Liner System Stability Calculations in Attachment 10, need to be revised to include the <u>internal</u> friction angle for the GCL.
58	1	OK. The proposed revision to Section 3.3.B.2 of Specification 02245 indicates that rolls of GCL will be installed such that liquids from a

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		higher panel will not be able to flow underneath a lower panel. This is acceptable.
61	1	<p>In response to Comment 61, transmissivity, the minimum transmissivity value, and test method were added to Specification 02246. However, the minimum value for transmissivity in Specification 02246 is identified as 1 cm/sec. As indicated in my review notes, an acceptable value for transmissivity is on the order of 1×10^{-4} m²/sec. Section 4.5.2 states that the geonet will have a transmissivity equal to 12 inches of sand with a hydraulic conductivity of 1×10^{-2} cm/sec. M/S should make this demonstration prior to requiring a minimum transmissivity in a specification.</p> <p>The minimum value for transmissivity in Specification 02246 is not acceptable or consistent with other portions of the Design Report, and the units of measurement are not correct. The design report needs to demonstrate that the geonet will have a transmissivity equal to 12 inches of sand with a hydraulic conductivity of 1×10^{-2} cm/sec as stated in Section 4.5.2 (see Comment 35). This is the transmissivity value that should be required in Specification 02246. [An acceptable value for transmissivity is on the order of 1×10^{-4} m²/sec.] In addition, the narrative in Section 4.1.1 may need to be revised since it states the hydraulic transmissivity of the geonet will be at least 3×10^{-1} cm²/sec (3×10^{-5} m²/sec).</p>
62	1	OK. The proposed revision to Specification 02932 indicates that IDOT Section 250 Class 1 seed mix will be used for the vegetative cover. This is acceptable.
64/65	7	<p>The organization chart helps address several of the QA/QC concerns. However, at the October 10, 2000 meeting M/S agreed to revise the document to indicate that the CQA Officer will be responsible for taking samples during construction. While the response to Comment 64 indicates this will be the case, the response to comments does not propose to revise the narrative of the Design Report to state this. The narrative in the Design Report should be revised to include the response to Comment 64. For example, Section 3.3 in the revised geonet Specification 02246 still shows that the contractor is responsible for taking confirmation samples. From the response to Comment 64 it appears that the CQA Consultant should perform this job. If this interpretation is correct, Specification 02246 (and portions of other specifications) may also need to be revised.</p>
66	1	<p>The response to Comment 66 states that the CQA manual for geosynthetic components will be revised to incorporate comments on the properties and specifications. However, it also indicates that this manual will not be provided until the final version of the Design Report is submitted. This is not acceptable. The revised CQA manual should have been provided with the November 3, 2000 submittal.</p>

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		The revised CQA manual for geosynthetic materials (Appendix F) should have been provided with the November 3, 2000 submittal. This revised CQA manual needs to be provided for review before the Design Report is finalized.
67	1	OK. The proposed addition of CQA procedures for the GCL (Section 6.0) to Appendix F is acceptable.
68	1	The table (Attachment 23) M/S proposes to incorporate in Appendix F needs to be revised to include earlier comments regarding each of the materials. The Table in Attachment 23 needs to be revised to include the following properties, their test methods, and minimum values: Geomembrane: yield strength, yield elongation, and asperity height, GCL: grab tensile strength. The minimum values for some of the parameters on this table may also need to be revised based on earlier comments in this review (e.g. transmissivity for the geonet, and the minimum internal friction angle for the GCL).
69	1	OK. The proposed revision to Section 2.3.1.3 of Appendix F indicates that the subgrade soils under the geosynthetics will be inspected for the proper parameters. This is acceptable.
70 all	2	OK. The response adequately addresses Comment 70.
71 all	2	OK. The proposed revision to Section 2.8.5 of Appendix F regarding the inspection of the geomembranes for wrinkles adequately addresses this comment.
74	1	See review notes for Comment 66 above. The revised CQA manual for soil materials (Appendix G) should have been provided with the November 3, 2000 submittal. This revised CQA manual needs to be provided for review before the Design Report is finalized.
75	1	OK. A table will be incorporated into Appendix G.
78	1	The response to this comment only addresses the testing of borrow soils for TCL/TAL constituents. It does not address the requirement to analyze soils per the referenced USEPA guidance document. Therefore, the parameters and their frequencies are specified below. [See copies of Tables 2.3 and 2.10 from USEPA Technical Guidance Document titled Quality Assurance and Quality Control for Waste Management Facilities (EPA/600/R-93/182, September 1993).] The soils identified in Tables 1A and 1B in Attachment 24 should be analyzed for the following parameters at the specified frequencies: Moisture Content: 1 test per 2,500 cu yd or each change in material. Atterberg Limits: 1 test per 6,500 cu yd or each change in material. Percentage Fines: 1 test per 6,500 cu yd or each change in material. Percent Gravel: 1 test per 6,500 cu yd or each change in material. Compaction Curve: 1 test per 6,500 cu yd or each change in material. Hydraulic Conductivity: 1 test per 13,000 cu yd or each change in

COMMENT	M/S GROUP	DISCUSSION OF RESPONSE TO COMMENTS
		<p>material.</p> <p>The soils identified in Tables 1C in Attachment 24 should be analyzed for the following parameters at the specified frequencies:</p> <p>Field Placed Moisture and Density (rapid tests): 5 tests per acre per lift</p> <p>Water Content (ASTM D2216): one in every 10 rapid moisture content tests.</p> <p>Total Density (ASTM D1556, 1587, or 2167): one in every 20 rapid density tests.</p>
80	1	OK. The proposed revision to Section 4.3.4.8.5 of Appendix G regarding the inspection/testing of the layer bonding adequately addresses this comment.
81	2	OK. The response to Comment 80 adequately addressed this comment.
82	2	<p>The response is adequate to describe how the leachate collection/detection systems are designed to avoid the need for maintenance. However, the narrative still needs to be designed to include this description.</p> <p>The narrative in the Design Report needs to be revised to include the response to Comment 82.</p>
84	2	The response did not fully address the issues in Comment 84. Each of the items in Comment 84 needs to be addressed individually. In addition, the response needs to indicate if the concrete down shoot (and the calculations for it in Appendix D) need to be removed from the application.
86.c	2	OK. The response adequately addresses the concerns regarding the GCL bedding layer in the cover system.

From: Rob Watson
To: Dwight, Stark, Timothy
Date: 11/17/00 10:39AM
Subject: Re: FW: Rob Watson

Tim,

I conveyed my comments the proposed landfill design to Monsanto/Solutia. I received their responses to comments on November 8, and need to let them know if they are acceptable ASAP so the project can be sent out for bids before Thanksgiving. (This was USEPA's schedule not mine). So time is of the essence.

It might be easier for me to describe the questions I have over the phone, but I will attempt to do so here too.

As we discussed several weeks ago, my concerns with slope stability in the proposed design involve the multiple layers used in the liner (and cover systems), and the internal and interface friction angles.

In response to my comments they evaluated interface friction angles by reviewing the literature and talking to a representative of GSE (Eric Reed). They then performed a slope stability analysis using the lowest interface friction angle (8 degrees for geonet/textured HDPE) and a FS of 1.4.

They also agreed to perform shear box testing (ASTM D5321-92) of the estimated worst case interfaces; GCL - geomembrane and geonet - geomembrane, as part of the CQA confirmation testing when the materials are received at the site. This testing should verify that the materials have an interface friction angle greater than the one used in the worst case slope stability analysis.

My question to you is: Is this acceptable? Specifically,

1. Is it acceptable to assume a single interface friction angle (based on information from a manufacturer) for a multiple layer liner system and then run the slope stability calculations with it? and,
2. Based on our previous conversations, I understood that it was preferable to determine the friction angles through actual testing in a shear box first, then do the calculations, and finally verify the materials actually have these values by testing them again when the materials arrive at the site.

Please call me at 217.524.3265 if you have any questions on the above.

Thanks again for taking the time to help address my questions regarding the design of this site.

Rob

>>> "Stark, Timothy Dwight" <T-STARK1@law.uiuc.edu> 11/16/00 04:39PM >>>

Rob:

What is happening? I am tied up tomorrow but what is the issue?

Tim Stark

-----Original Message-----

From: Myrna L. Webber [<mailto:mlwebber@uiuc.edu>]

Sent: Thursday, November 16, 2000 4:21 PM

To: t-stark1@law.uiuc.edu

Subject: Rob Watson

Rob Watson, IL EPA 524-3265, called and needs to talk with you ASAP. It is a complicated matter regarding factors of safety on slope stability of GCL's. Monsanto has questions and would like a response "yesterday." They want to send the project out for bid and hire contractor right away. His e-mail address is rob.watson@epa.state.il.us.

.....
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.....

CC: DRAGOVICH, Ted

DATE: November 17, 2000

PHONE CALL: IEPA: Rob Watson
Tim Stark, UIUC (217-333-7394)

SUBJECT: Response to Comments - Phase II

1630200005 -- St. Clair County
Sauget Area 1, Dead Creek
Sediment Containment Cell
Superfund/Technical File

On November 17, 2000 I sent an e-mail to Prof. Tim Stark at UIUC regarding Monsanto/Solutia's responses to my Comment 24 on the Design Report. Tim called in response to my e-mail today. He had the following comments:

1. We should require testing of the materials (in a shear box to determine the interface friction angles) before they arrive at the site. If we wait until the materials are on-site and there are problems, the company will likely pressure USEPA/IEPA to allow the project to proceed due to cost/schedule issues. In order to avoid this scenario we should require testing of the materials as soon as a manufacturer is selected. NOTE: this should be done in addition to, not in place of, the CQA confirmation testing.

We need to make it very clear that if M/S does not agree to this condition, and there are problems, they bear the responsibility because they took the risk.

2. Multiple interfaces should be tested to verify that the ones they assume to be worst-case, are in-fact the ones with the smallest interface friction angle. He suggested that in addition to the GCL/geomembrane and geonet/geomembrane, that they also test the GCL/soil interface. Another possible interface could be the smooth geomembrane and soil interface of the primary liner system.
3. The minimum static Factor of Safety (FS) should be clearly specified. When I said it appeared they used a FS of 1.4 in the revised calculations (Attachment 10), he was concerned that this FS was too small. I recommended a FS of 1.5 because this is what is specified for nonhazardous waste landfills [35 IAC 811.304(d)] (a FS for slope stability is not specifically required in the RCRA regulations). He agreed. He also noted that a FS of 1.4 would allow for a friction angle that was approximately 10° less than that required for a FS of 1.5. The larger the friction angle, the more stable the slope. Therefore, it is important that the design does not specify a FS or a friction angle that is too small.

United States
Environmental Protection
Agency

Office of Research and
Development
Washington DC 20460

EPA/600/R-93/182
September 1993



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Technical Guidance Document

Quality Assurance and Quality Control for Waste Containment Facilities

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PB94-159100

EPA/600/R-93/182

September 1993

Technical Guidance Document:

**QUALITY ASSURANCE AND QUALITY CONTROL
FOR WASTE CONTAINMENT FACILITIES**

by

**David E. Daniel
University of Texas at Austin
Department of Civil Engineering
Austin, Texas 78712**

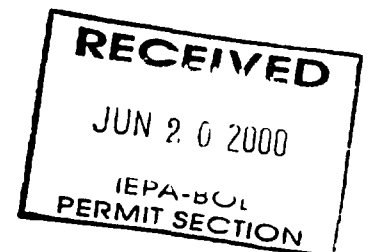
and

**Robert M. Koerner
Geosynthetic Research Institute
West Wing, Rush Building No. 10
Philadelphia, Pennsylvania 19104**

Cooperative Agreement No. CR-815546-01-0

Project Officer

**David A. Carson
Risk Reduction Engineering Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
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**RISK REDUCTION ENGINEERING LABORATORY
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2.4.2.6 Testing Frequency

The CQA plan should stipulate the frequency of testing. Recommended minimum values are shown in Table 2.3. The tests listed in Table 2.3 are normally performed prior to construction as part of the characterization of the borrow source. However, if time or circumstances do not permit characterization of the borrow source prior to construction, the samples for testing are obtained during excavation or delivery of the soil materials.

Table 2.3 - Recommended Minimum Testing Frequencies for Investigation of Borrow Source

Parameter	Frequency
Water Content	1 Test per 2000 m ³ or Each Change in Material Type
Atterberg Limits	1 Test per 5000 m ³ or Each Change in Material Type
Percentage Fines	1 Test per 5000 m ³ or Each Change in Material Type
Percent Gravel	1 Test per 5000 m ³ or Each Change in Material Type
Compaction Curve	1 Test per 5000 m ³ or Each Change in Material Type
Hydraulic Conductivity	1 Test per 10,000 m ³ or Each Change in Material Type

Note: 1 yd³ = 0.76 m³

2.5 Inspection during Excavation of Borrow Soil

It is strongly recommended that a qualified inspector who reports directly to the CQA engineer observe all excavation of borrow soil in the borrow pit. Often the best way to determine whether deleterious material is present in the borrow soil is to observe the excavation of the soil directly.

A key factor for inspectors to observe is the plasticity of the soil. Experienced technicians can often determine whether or not a soil has adequate plasticity by carefully examining the soil in the field. A useful practice for field identification of soils is ASTM D-2488, "Description and Identification of Soils (Visual-Manual Procedure)." The following procedure is used for identifying clayey soils.

Table 2.10 - Recommended Tests and Observations on Compacted Soil

Parameter	Test Method	Minimum Testing Frequency
Water Content (Rapid) (Note 1)	ASTM D-3017 ASTM D-4643 ASTM D-4944 ASTM D-4959	13/ha/lift (5/acre/lift) (Notes 2 & 7)
Water Content (Note 3)	ASTM D-2216	One in every 10 rapid water content tests (Notes 3 & 7)
Total Density (Rapid) (Note 4)	ASTM D-2922 ASTM D-2937	13/ha/lift (5/acre/lift) (Notes 2, 4 & 7)
Total Density (Note 5)	ASTM D-1556 ASTM D-1587 ASTM D-2167	One in every 20 rapid density tests (Notes 5, 6, & 7)
Number of Passes	Observation	3/ha/lift (1/acre/lift) (Notes 2 & 7)
Construction Oversight	Observation	Continuous

Notes:

1. ASTM D-3017 is a nuclear method, ASTM D-4643 is microwave oven drying, ASTM D-4944 is a calcium carbide gas pressure tester method, and ASTM D-4959 is a direct heating method. Direct water content determination (ASTM D-2216) is the standard against which nuclear, microwave, or other methods of measurements are calibrated for on-site soils.
2. In addition, at least one test should be performed each day soil is compacted and additional tests should be performed in areas for which CQA personnel have reason to suspect inadequate compaction.
3. Every tenth sample tested with ASTM D-3017, D-4643, D-4944, or D-4959 should be also tested by direct oven drying (ASTM D-2216) to aid in identifying any significant, systematic calibration errors.
4. ASTM D-2922 is a nuclear method and ASTM D-2937 is the drive cylinder method. These methods, if used, should be calibrated against the sand cone (ASTM D-1556) or rubber balloon (ASTM D-2167) for on-site soils. Alternatively, the sand cone or rubber balloon method can be used directly.
5. Every twentieth sample tested with D-2922 should also be tested (as close as possible to the same test location) with the sand cone (ASTM D-1556) or rubber balloon (ASTM D-2167) to aid in identifying any systematic calibration errors with D-2922.
6. ASTM D-1587 is the method for obtaining an undisturbed sample. The section of undisturbed sample can be cut or trimmed from the sampling tube to determine bulk density. This method should not be used for soils containing any particles > 1/6-th the diameter of the sample.
7. 1 acre = 0.4 ha.